

Q12. Partitioning Rectangular Block (60 Marks):

As illustrated in Figure Q12(a), a major rectangular block is composed of $N \times 2$ cells, and each cell contains an integer, $a_{i,j}$, where $1 \leq i \leq N$ and $1 \leq j \leq 2$.

$a_{1,1}$	$a_{1,2}$
$a_{2,1}$	$a_{2,2}$
...	...
...	...
$a_{N,1}$	$a_{N,2}$

Figure Q12(a): A major rectangular block composed of $N \times 2$ cells

The major rectangular block can be divided into a number of disjoint rectangular subblocks, as shown in Figure Q12(b). Note that each subblock must be composed of an integer number of cells and any two subblocks must not share the same cell. In this example, the major rectangular block is divided into four rectangular subblocks, which contains one, two, three, and four cells, respectively.

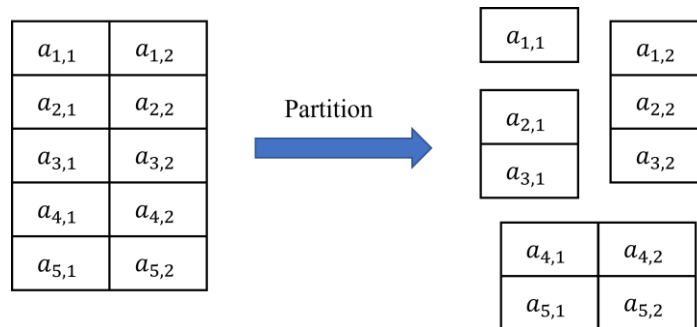


Figure Q12(b): Dividing a major rectangular block

The value of a rectangular subblock is equal to the sum of the integer(s) inside its cell(s). If a subblock has a value of 0, then it is called a **zero-subblock**. You are required to find out the maximum number of disjoint zero-subblocks that can be partitioned from a rectangular block. For example, if $N = 3$, consider the following sample input

0	0
1	-1
1	1

There are four possible subblocks which has a value of 0.

0	0
1	-1
1	1

0	0
1	-1
1	1

0	0
1	-1
1	1

0	0
1	-1
1	1

However, **NOT** all the above zero-subblocks can be simultaneously obtained because some of them are not disjoint. So, the maximum number of disjoint zero-subblocks is 3 for this major rectangular block.

Write a programme to

Input, in sequence,

1. A positive integer, N , where $1 \leq N \leq 10000$, to indicate the number of rows in the major rectangular block.
2. Then N lines of data; for each line i , two integers, $a_{i,1}$ and $a_{i,2}$, are given; note that $a_{i,j}$ indicates the value of the cell in the i -th row and j -th column of the major rectangular block, where $-10^9 \leq a_{i,j} \leq 10^9$ for $1 \leq i \leq N$, $1 \leq j \leq 2$.

Output the maximum number of disjoint zero-subblocks that can be partitioned from the major rectangular block.

试题 12. 分割矩形块 (60 分) :

如图 Q12(a)所示, 一个主矩形块是由 $N \times 2$ 个单元格所组成。其中每个单元格包含了一个整数, $a_{i,j}$, 已知 $1 \leq i \leq N$ 和 $1 \leq j \leq 2$ 。

$a_{1,1}$	$a_{1,2}$
$a_{2,1}$	$a_{2,2}$
...	...
...	...
$a_{N,1}$	$a_{N,2}$

图 Q12(a): 由 $N \times 2$ 个单元格所组成的主矩形块

如图 Q12(b) 所示, 此矩形块可被分割成多个分离的子矩形块。请注意, 每个子块必须由整数个单元格组成, 同时两个子块之间不得共享同一单元格。在这个例子中, 主矩形块被分割成四个子矩形块, 这些子块分别包含了一个、两个、三个以及四个单元格。

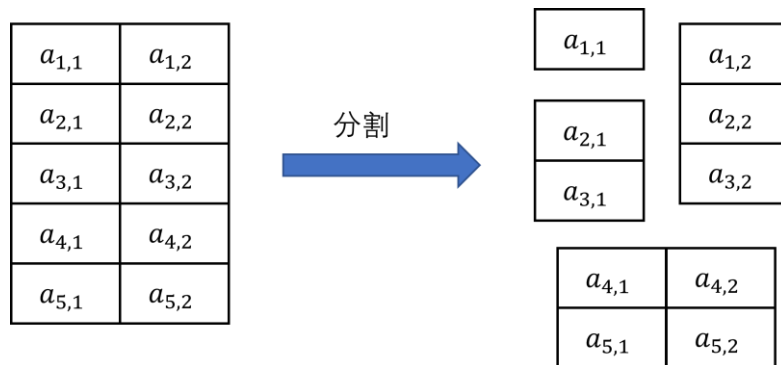


图 Q12(b): 分割一个主矩形块

假设子矩形块的值等于其所包含单元格内的整数之和, 同时若此和为 0, 我们则称该子块为**零-子块**。给定一个主矩形块, 找出可以从中分割出来、最大数量的零-子块。

例如: 假设 $N = 3$, 考虑以下范例

0	0
1	-1
1	1

其中有四个可能的零-子块, 如下所示。

0	0
1	-1
1	1

0	0
1	-1
1	1

0	0
1	-1
1	1

0	0
1	-1
1	1

然而，并非所有的零-子块都可以被同时分割出来，因为当中有些零-子块是共享同一单元格的。因此，从这个主矩形块中可以被分割出来的零-子块的最大数量为 3。

试写一程式以

依序输入

- (1) 一个正整数 N ，以表示主矩形块的行数，同时已知 N 满足条件 $1 \leq N \leq 10000$ 。
- (2) 接着， N 行的数据；其中第 i 行的数据包含了两个整数， $a_{i,1}$ 和 $a_{i,2}$ ；且已知在 $1 \leq i \leq N$ ， $1 \leq j \leq 2$ ，的范围内， $-10^9 \leq a_{i,j} \leq 10^9$ ，而 $a_{i,j}$ 表示了主矩形块里、第 i 行和第 j 列的单元格的值。

输出 可以从这主矩形块中分割出来、不相交的零-子块的最大数量。

Test Cases:

Input (输入)	Output (输出)
3 0 0 1 0 0 -1	4
8 65 90 -35 90 -30 90 30 90 -30 90 45 -45 25 55 25 -55	4
4 500000000 499999999 499999999 -500000000 -500000000 -499999998 499999998 -499999999	1
10 1 2 3 4 5 6 7 8 9 10 -10 -9 -8 -7 -6 -5 -4 -3 -2 -1	2
12 6 36 12 -24 -12 -18 24 18 -6 -36 48 -48 30 -6 12 -6 -24 -6 0 30 -12 0	7

0 12	
20 -656090 656090 -540341 634146 -499690 405885 -952015 -334046 -438823 438823 436584 849477 904839 225245 -225245 344739 -326866 -344739 -645769 -596896 407162 326866 275102 785646 197473 180111 -226336 -1292623 -180111 1699070 213038 938824 425973 -186380 -806509 -425973 -116630 -326471 -752787 1195888	6
50 1 0 -1 0 2 -1 -2 2 0 1 -2 -2 0 -2 2 0 -2 -2 1 0 0 -1 0 -2 0 -2 -1 -1 0 -2 -1 -2 -1 -1 -1 0 -2 1 0 -2 1 0 -2 -1 2 2 -2 -1 0 -2	36

-2 -1	
-2 -1	
-2 0	
1 0	
-2 -2	
-2 -1	
1 -1	
1 1	
-1 -1	
1 -2	
-2 -1	
-2 -1	
2 -2	
0 2	
0 2	
0 1	
-1 -1	
-2 0	
-2 1	
1 0	
1 1	
1 -2	
-1 -1	
-1 -1	
-1 0	
100	57
-1 -2	
3 -2	
3 2	
0 -1	
-3 -2	
2 -2	
3 3	
-3 2	
1 2	
0 -1	
-2 3	
2 2	
1 -3	
3 2	
-1 -2	
-2 2	
-2 -3	
-2 3	
-3 -3	
-3 0	
2 2	
3 0	
-1 1	

-2 1	
0 -2	
3 3	
-1 -1	
2 0	
2 3	
-1 -1	
1 3	
1 0	
2 1	
3 2	
0 2	
-3 -3	
-1 3	
2 -3	
0 -1	
0 2	
-2 0	
-2 0	
2 0	
3 2	
2 1	
-1 2	
-2 0	
-1 1	
-2 -2	
-2 2	
-3 -3	
0 1	
3 3	
-2 -1	
2 3	
-1 -3	
-2 -3	
3 -3	
0 3	
-2 0	
1 3	
0 0	
1 1	
3 1	
0 -2	
-2 -3	
2 3	
-1 -1	
2 -3	
1 -1	
3 -1	
1 -2	

-3 -2 1 1 0 2 0 0 2 -3 3 -3 -3 2 -2 0 -1 2 0 -3 -3 1 0 -3 3 1 2 -1 1 1 1 3 0 -2 -3 0 -3 -3 -3 -2 2 -1 -3 -2 -1 1 3 -2 1 -3 3 2 3 -1 -3 3	
200 315 314 972 971 321 320 815 814 950 949 647 646 151 150 347 346 640 639 710 709 378 377 554 553 349 348 911 -911 51 -51 541 540 655 654 328 327 811 810 941 940	14

624 623	
338 337	
846 845	
739 738	
710 709	
867 866	
717 716	
46 45	
69 68	
689 688	
510 509	
54 53	
196 195	
581 580	
446 445	
258 257	
875 874	
761 760	
282 281	
263 262	
566 565	
724 723	
252 251	
57 -57	
243 -243	
750 749	
465 464	
438 437	
236 235	
109 108	
110 109	
940 939	
45 44	
899 898	
941 940	
625 624	
961 960	
503 502	
576 575	
606 605	
601 600	
993 992	
882 881	
832 831	
640 639	
746 745	
665 664	
237 236	
509 508	

722 721	
370 369	
17 16	
948 947	
145 -145	
777 -777	
119 118	
792 791	
48 47	
71 70	
547 546	
10 9	
155 154	
635 634	
552 551	
356 355	
461 460	
841 840	
37 36	
651 650	
586 585	
508 507	
275 274	
735 734	
735 734	
386 385	
281 280	
472 471	
84 83	
781 780	
244 243	
336 335	
767 766	
619 618	
233 -233	
314 -314	
238 237	
771 770	
970 969	
904 903	
223 222	
190 189	
656 655	
610 609	
313 312	
802 801	
927 926	
625 624	
253 252	

529 528	
986 985	
186 185	
857 856	
733 732	
907 906	
285 284	
873 872	
432 431	
420 419	
884 883	
968 967	
47 46	
912 911	
240 239	
327 -327	
859 -859	
430 429	
82 81	
774 773	
351 350	
176 175	
724 723	
391 390	
381 380	
334 333	
534 533	
893 892	
457 456	
516 515	
142 141	
425 424	
488 487	
298 297	
623 622	
73 72	
329 328	
420 419	
734 733	
469 468	
711 710	
375 374	
614 613	
850 849	
81 80	
682 -682	
894 -894	
333 332	
453 452	

311 310	
977 976	
861 860	
116 115	
112 111	
239 238	
76 75	
62 61	
870 869	
373 372	
440 439	
197 196	
516 515	
675 674	
448 447	
599 598	
519 518	
403 402	
545 544	
649 648	
368 367	
395 394	
955 954	
705 704	
963 962	
546 545	
779 -779	
553 -553	
209 208	
672 671	
909 908	
431 430	
263 262	
4	2
-2 -3	
1 4	
-1 5	
-2 -2	